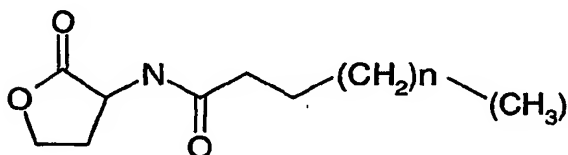
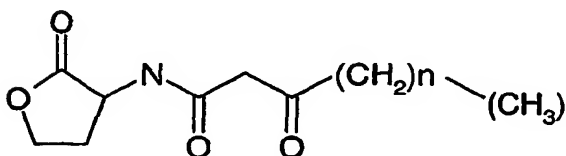


CLAIMS

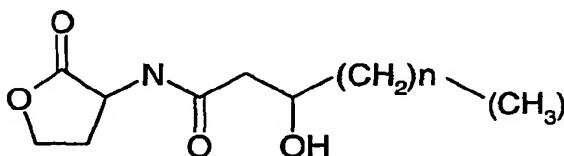
1. A method for the treatment of a bacterial infection of a subject, the method comprising administration of a monoclonal antibody to a molecule selected from the group consisting of a homoserine lactone molecule of general formula:



Formula I



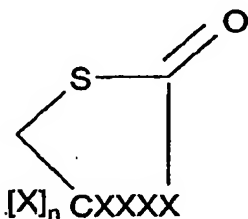
Formula II



Formula III

where  $n = 0$  to  $12$ ;

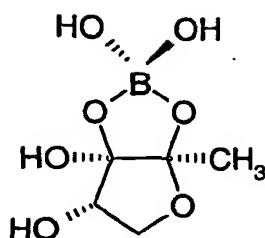
a peptide thiolactone of general formula (IV):



where X is any amino acid and  $n = 1$  to  $10$ ;

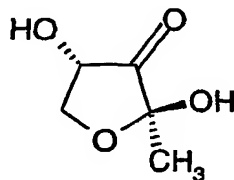
or Auto Inducer-2 (AI-2),

5



15

or Pro-AI-2 or a C<sub>1</sub>-C<sub>10</sub> saturated or unsaturated carboxylic acid derivative thereof



25

wherein said antibody specifically binds to the free soluble form of the homoserine lactone, peptide thiolactone, AI-2 or Pro-AI-2 or a C<sub>1</sub>-C<sub>10</sub> saturated or unsaturated carboxylic acid derivative thereof in the presence of conjugated derivatives thereof.

30

2. A method as claimed in claim 1, in which the homoserine lactone molecule of general formula I is *N*-butanoly-L-homoserine lactone (BHL) where  $n = 0$ , *N*-dodecanoyl-L-homoserine lactone (dDHL) where  $n = 8$  and *n*-tetradecanoyl-L-homoserine lactone (tDHL) where  $n = 10$ .

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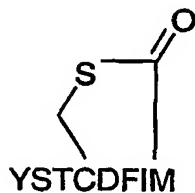
3. A method as claimed in claim 1, in which the homoserine lactone molecule of general formula II is *N*-(-3-oxohexanoyl)-L-homoserine lactone (OHHL) where  $n = 2$  and *N*-(-3-oxododecanoyl)-L-homoserine lactone (OdDHL) where  $n = 8$ .

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4. A method as claimed in claim 1, in which the homoserine lactone molecule of general formula III is *N*-(-3-hydroxybutanoyl)-L-homoserine lactone (HBHL) where  $n = 0$ .

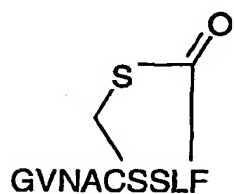
5. A method as claimed in claim 1, in which the peptide thiolactone molecule is:

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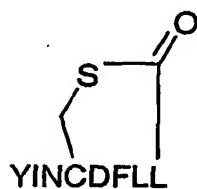
or

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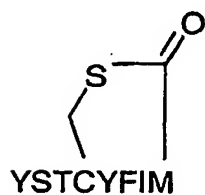
or

25



30

or



35

6. A method as claimed in any one of claims 1 to 5, in which the monoclonal antibody is a single chain antibody (scAb).

7. A method as claimed in any one of claims 1 to 5, in which the monoclonal antibody is an antibody fragment.

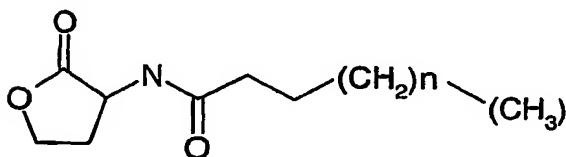
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8. A method as claimed in claim 7, in which the antibody fragment is a single chain variable fragment (scFv).

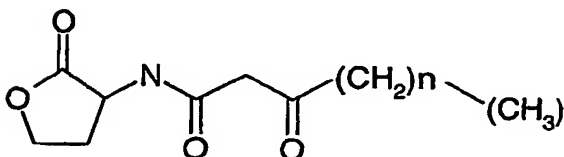
9. A method as claimed in claim 7, in which the antibody fragment is a single domain fragment.

5 10. A method for the treatment of immuno-suppression caused by bacterial infection of a subject, the method comprising administration of an antibody as defined in any one of claims 1 to 9.

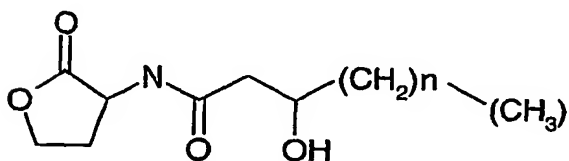
10 11. A method of screening a population of monoclonal antibodies for an anti-bacterial monoclonal antibody, the method comprising conjugating a molecule selected from the group consisting of a homoserine lactone molecule of general formula:



Formula I



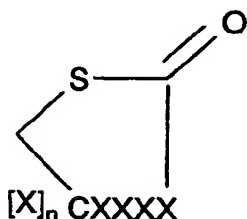
Formula II



Formula III

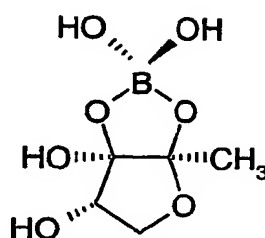
15 where n = 0 to 12,

a peptide thiolactone of general formula (IV):

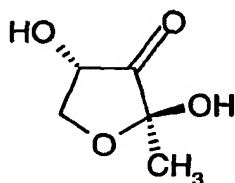


where X is any amino acid and  $n = 1$  to 10;

5 or Auto Inducer-2 (AI-2),



15 or Pro-AI-2 or a  $C_1$ - $C_{10}$  saturated or unsaturated carboxylic acid derivative thereof



25 to a carrier molecule and using the conjugate so formed to identify a monoclonal antibody that specifically binds to the free soluble form of the homoserine lactone, peptide thiolactone, AI-2 or Pro-AI-2 or a  $C_1$ - $C_{10}$  saturated or unsaturated carboxylic acid derivative thereof from the population of monoclonal antibodies in the presence of conjugated derivatives thereof.

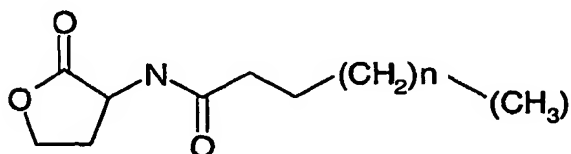
30 12. A method as claimed in claim 11, in which the carrier molecule is a protein.

35 13. A method as claimed in claim 11 or claim 12, in which the population of monoclonal antibodies is a phage display library.

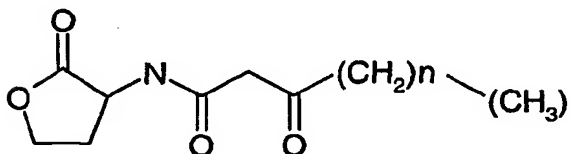
14. A monoclonal antibody identified by a method of any one of claims 11 to 13 for use in medicine.

5 15. The use of a monoclonal antibody identified by a method according to any one of claims 11 to 13 in the preparation of a medicament for the treatment of a bacterial infection.

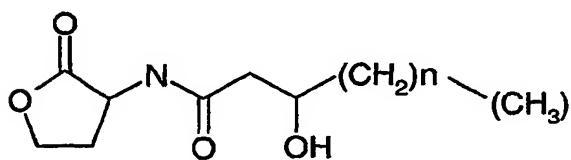
10 16. The use of a molecule selected from the group consisting of a homoserine lactone molecule of general formula:



Formula I



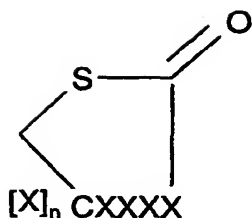
Formula II



Formula III

where  $n = 0$  to 12,

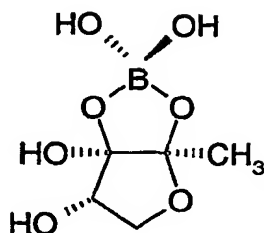
15 a peptide thiolactone of general formula (IV):



where X is any amino acid and  $n = 1$  to 10;

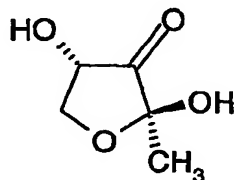
or Auto Inducer-2 (AI-2),

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or Pro-AI-2 or a C<sub>1</sub>-C<sub>10</sub> saturated or unsaturated carboxylic acid derivative thereof

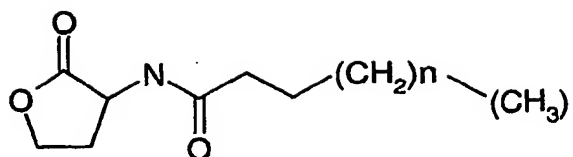
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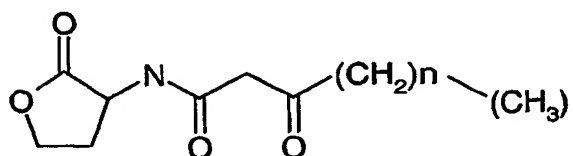
30 to screen a population of monoclonal antibodies in order to identify a monoclonal antibody that specifically binds to the free soluble form of said molecule in the presence of conjugated derivatives thereof.

35 17. A method of treatment of a bacterial infection of a subject, the method comprising isolation of a molecule selected from the group consisting of a homoserine lactone molecule of general formula:

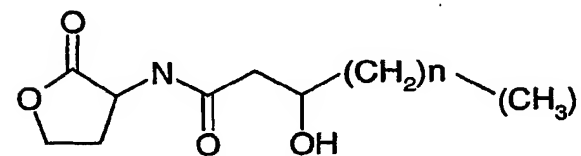
57



Formula I



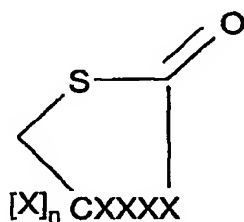
Formula II



Formula III

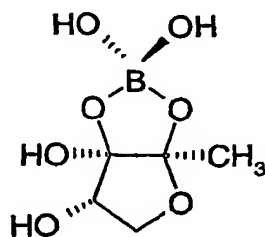
where  $n = 0$  to  $12$ ,

5 a peptide thiolactone of general formula (IV):



where  $X$  is any amino acid and  $n = 1$  to  $10$ ;

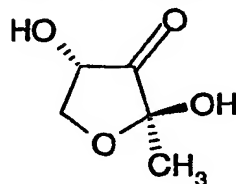
10 or Auto Inducer-2 (AI-2),



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or Pro-AI-2 or a C<sub>1</sub>-C<sub>10</sub> saturated or unsaturated carboxylic acid derivative thereof



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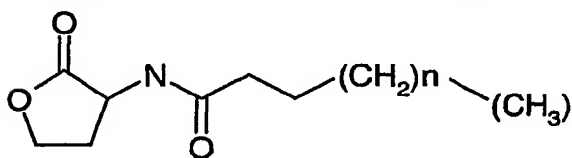
in a sample from said subject and using said molecule to screen a population of monoclonal antibodies for an anti-bacterial monoclonal antibody that specifically binds to the free soluble form of the said molecule, in the presence of conjugated derivatives thereof and administering said monoclonal antibody so identified to a patient in need thereof.

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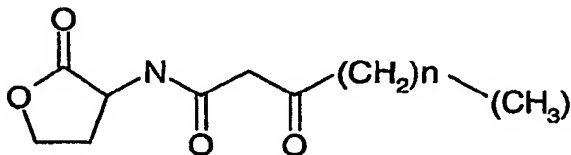
18. A method as claimed in claim 17, in which the sample is of blood, saliva, tissue, cerebro-spinal fluid, tears, semen, urine, faeces, pus, skin, or mucous secretions.

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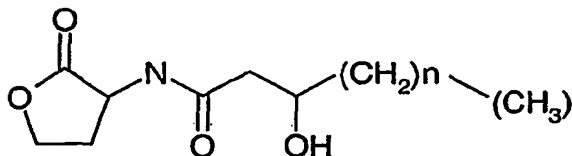
19. A monoclonal antibody to a molecule selected from the group consisting of a homoserine lactone molecule of general formula:



Formula I



Formula II

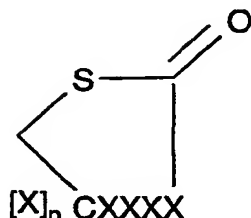


Formula III

where n = 0 to 12,

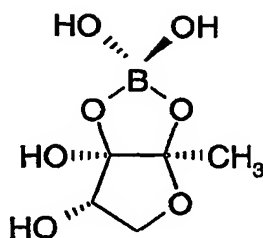
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a peptide thiolactone of general formula (IV):

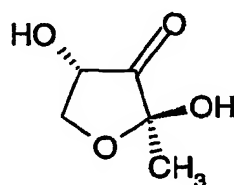


where X is any amino acid and  $n = 1$  to 10;

or Auto Inducer-2 (AI-2),



or Pro-AI-2 or a  $C_1$ - $C_{10}$  saturated or unsaturated carboxylic acid derivative thereof



wherein said antibody specifically binds to the free soluble form of the molecule in the presence of conjugated derivatives thereof.

20. A monoclonal antibody as claimed in claim 19, in which the homoserine lactone molecule of general formula I is *N*-butanoly-*L*-homoserine lactone (BHL) where  $n = 0$ , *N*-dodecanoyl-*L*-homoserine lactone (dDHL) where  $n = 8$  and *n*-tetradecanoyl-*L*-homoserine lactone (tDHL) where  $n = 10$ .

21. A monoclonal antibody as claimed in claim 19, in which the homoserine lactone molecule of general formula II is *N*-(-3-oxohexanoyl)-L-homoserine lactone (OHHL) where  $n = 2$  and *N*-(-3-oxododecanoyl)-L-homoserine lactone (OdDHL) where  $n = 8$ .

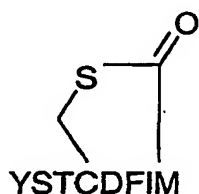
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22. A monoclonal antibody as claimed in claim 19, in which the homoserine lactone molecule of general formula III is *N*-(-3-hydroxybutanoyl)-L-homoserine lactone (HBHL) where  $n = 0$ .

10

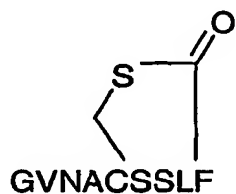
23. A monoclonal antibody as claimed in claim 19, in which the peptide thiolactone molecule is:

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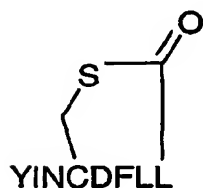
or

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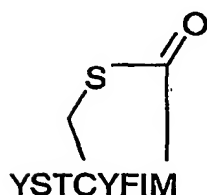
or

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or

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24. A monoclonal antibody as claimed in any one of claims 19 to 23 which is a single chain antibody (scAb)

5 25. A monoclonal antibody as claimed in any one of claims 19 to 23 which is an antibody fragment.

26. A monoclonal antibody as claimed in claim 25, in which the antibody fragment is a single chain variable fragment (scFv).

10

27. A monoclonal antibody as claimed in claim 25, in which the antibody fragment is a single domain fragment.

15 28. A pharmaceutical composition comprising an antibody as defined in any one of claims 19 to 27.

29. A kit of parts comprising an antibody as defined in any of claims 19 to 27 provided in unit dosage form and instructions for use in a method of any one of claims 1 to 10.

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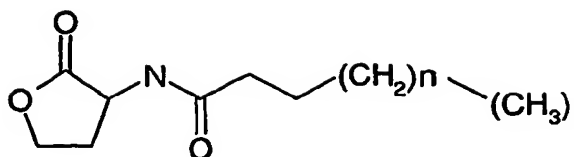
30. A monoclonal antibody as defined in any one of claims 19 to 27 for use in medicine.

25 31. The use of a monoclonal antibody as defined in any one of claims 19 to 27 for use in the preparation of a medicament for the treatment of bacterial infection or immuno-suppression caused by bacterial infection.

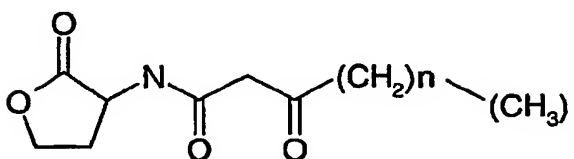
32. A monoclonal antibody to a molecule selected from the group consisting of a homoserine lactone molecule of general formula:

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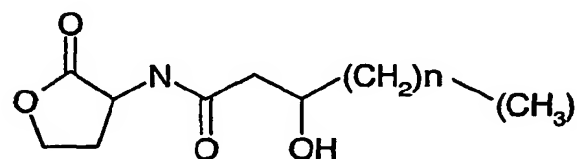
62



Formula I



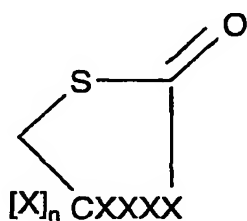
Formula II



Formula III

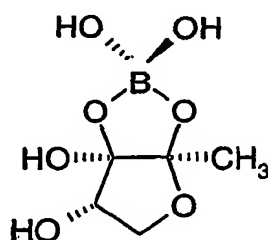
where  $n = 0$  to  $12$ ,

5 a peptide thiolactone of general formula (IV):



where  $X$  is any amino acid and  $n = 1$  to  $10$ ;

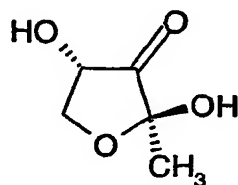
10 or Auto Inducer-2 (AI-2),



20

or Pro-AI-2 or a C<sub>1</sub>-C<sub>10</sub> saturated or unsaturated carboxylic acid derivative thereof

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wherein said antibody specifically binds to the free soluble form of the molecule in the presence of conjugated derivatives thereof, in which said antibody is obtainable by a method comprising the steps of:

20

- (1) screening a phage display library of monoclonal antibodies using said molecule conjugated to a carrier molecule.
- (2) optionally re-screening said library.
- (3) screening a phage display library with free unconjugated molecule.
- (4) optionally rescreening said library.

25

33. A single chain antibody (scAb) from *E. coli* clones G3H5, G3B12, G3G2 or G3H3 deposited as NCIMB-41167, NCIMB-41168, NCIMB-41169 and NCIMB-41170 respectively.